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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,773	08/08/2006	Toshihiro Iwakuma	292948US0PCT	4654
22850	7590	04/13/2011	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			YANG, JAY	
			ART UNIT	PAPER NUMBER
			1786	
			NOTIFICATION DATE	DELIVERY MODE
			04/13/2011	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/588,773	<b>Applicant(s)</b> IWAKUMA ET AL.	
	<b>Examiner</b> J. L. YANG	<b>Art Unit</b> 1786	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2011.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-19 and 21-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 21-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. This Office Action is in response to the Applicant's Amendment filed 01/27/11.

#### ***Examiner's Note***

1. The Examiner has relied upon publication US 2004/0086745 A1 as an English translation of PCT publication WO 03/080760 A1 (herein referred to as "Iwakuma et al").

#### ***Claim Rejections – 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

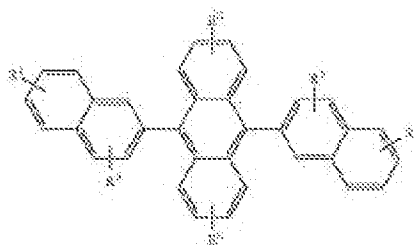
2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-6, 8-10, 12, 14-19, and 21- 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higashi et al. (US 6,617,051 B1) and further in view of Begley et al. (US 2005/0095453 A1).

Regarding Claims 1-5, 17, 19, 21, and 23, Higashi et al. discloses an organic EL device comprising an organic compound layer including an organic emitting layer sandwiched between a pair of electrodes, in which that organic compound layer is formed from an organic compound material having an impurity concentration of 0 ppm (col. 46, Claim 17) which is in a range within 0-1000 ppm (col. 32, lines 39-49). Higashi et al. discloses a doping method for efficient mixed emission using a host material and a fluorescent dye dopant for the light-emitting layer (col. 22, lines 33-38). Higashi, et al. further discloses that the impurities in the organic compound material (including the host) include halogen compounds (col. 29, lines 59-63). Higashi et al., however, does not disclose a dopant that is a phosphorescent organic metal complex.

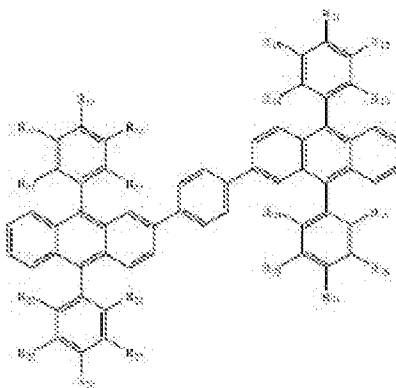
Begley et al. discloses a light-emitting layer of an organic EL device comprising of a host material doped with a guest compound, in which the dopant can be chosen from phosphorescent metal complexes ([0115]). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the phosphorescent dopant for the dopants in the organic EL device as disclosed by Higashi et al. The motivation is provided by the fact that the use of phosphorescent dopants is known as disclosed by Begley et al. ([0115]), and in addition to the fact that the host material as disclosed by Higashi et al. (col. 10) is sufficiently similar to the anthracene derivatives as disclosed by Begley et al:



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(page 11) in which  $R^1$  = fused to produce a secondary anthracene group ([0140]) in which other R groups can be amino groups ([0142]), rendering the substitution predictable with a reasonable expectation of success. It should be noted that the method of detecting impurities in the organic EL device as described in Claim 17, in which "the halogen element mass concentrations described above is identified respectively by inductively coupled plasma-mass spectrometry (ICP-MS analysis) or a coulometric titration method" adds no further limitations to this claim and thus does not differentiate it from the prior art.

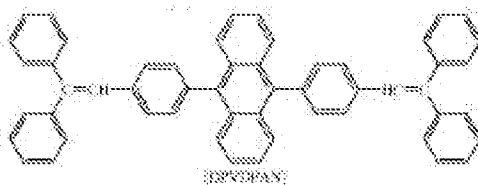
Regarding Claims 6, 8, 12, and 14, Higashi et al. discloses the following host material in the light-emitting layer:



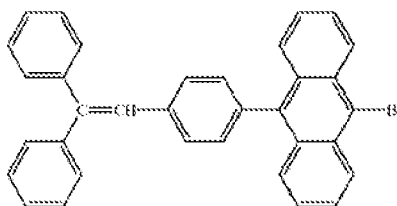
(col. 10) where  $R_{11} - R_{25}$  = alkyl such that  $Ar' =$  phenylene,  $R_A = R_B =$  aromatic hydrocarbon group with 14 carbon ring atoms substituted with 2 phenyl groups.

Regarding Claims 9, 10, 15, and 16, Higashi et al. discloses the following compound for host material (as well as light-emitting material) in the light-emitting layer:

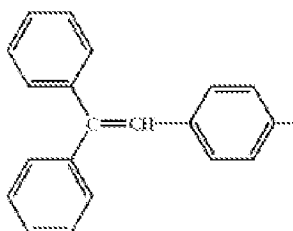
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(col. 38) and subsequently discloses in its synthesis the possibility of producing the following impurity that can be present:



(col. 39) such that Ar = Ar' = anthracene, X<sub>1</sub> = Br, R<sub>A</sub> = shown below:



, and X<sub>2</sub> = H such that it satisfies Formula (3) of Claim 9 and Formula (6) of Claim 10.

Regarding Claim 18. Higashi et al. discloses an electron transport/injection material Alq that is placed adjacent (col. 3, lines 20-21) to the light-emitting layer that is free from any impurities (pure, col. 41, Table 2, Examples 1-7).

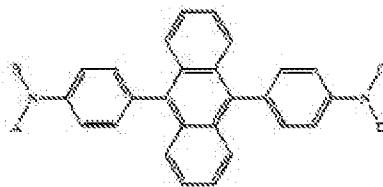
Regarding Claim 22. Higashi et al. discloses a wide variety of light-emitting material for the light-emitting layer (col. 9-10) for an organic EL device such that its halogen impurity as mentioned above in the 102(b) rejection is between 0-1000 ppm

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(col. 32, lines 39-49). Higashi, et al., however, does not disclose a phosphorescent organic metal complex. Begley et al. discloses the use of phosphorescent metal complexes for organic EL devices as light-emitting material (dopants) ([0115]) that can be substituted as described above with proper motivation.

Regarding Claim 24, Higashi et al. discloses an organic EL device comprising an organic compound layer including an organic emitting layer sandwiched between a pair of electrodes. Higashi et al. discloses a doping method for efficient mixed emission using a host material and a fluorescent dye dopant for the organic emitting layer (col. 22, lines 33-38), in which the host material meets the limitations of Claim 23 as described above in the 102(b) rejection, and also such that the halogen impurity concentration of the light-emitting material (dopant) is between 0-1000 ppm (col. 32, lines 39-49). Higashi et al., however, does not disclose a phosphorescent organic metal complex. Begley et al. discloses the phosphorescent organic metal complex as a light-emitting material (dopant) as described above.

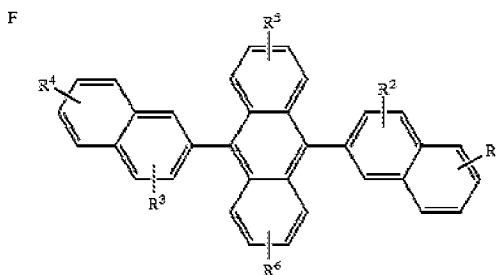
Regarding Claim 25, Higashi et al. discloses the following as suitable host material in the light-emitting layer:



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(col. 19, col. 22, line 26) where A-D = aryl groups like phenyl. However, Higashi et al. does not explicitly disclose an aromatic heterocyclic as host material.

As shown above and again shown below, Begley et al. discloses the following as possible host material:



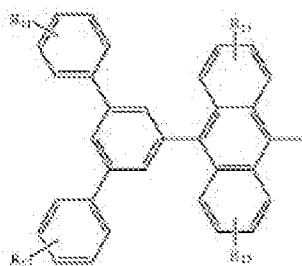
in which one of the R substituents can be pyridyl ([0141]) and aryl amino groups ([0142]). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute such a host material for the host materials as disclosed by Higashi et al. as shown above. The motivation is provided by the fact that both references are not particularly limiting as to the nature of the host material, in addition to the fact that they both disclose anthracene derivatives that are substituted with arylamine groups that are designed to function as host materials in the light-emitting layer of organic EL devices, thus rendering the substitution predictable with a reasonable expectation of success.

3. Claims 7, 11, and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Higashi et al. (US 6,617,051 B1) and further in view of Begley et al. (US 2005/0095453 A1) and Hu et al. (US 6,479,172 B2).



Higashi et al. in view of Begley et al. disclose the organic EL device as described in Claim 6. They do not, however, disclose an aromatic hydrocarbon represented by Formula (1) where Ar = benzentriyl, pyridinetriyl, pyrimidinetriyl, or triazinetriyl and R<sub>A</sub>, R<sub>B</sub>, and R<sub>C</sub> represent independently a substituted or non-substituted aromatic hydrocarbon group having 6-30 ring carbon atoms, a substituted or non-substituted aromatic heterocyclic group having 3-20 ring carbon atoms or a substituted or non-substituted amino group, and where R<sub>A</sub>, R<sub>B</sub>, and R<sub>C</sub> each may be the same or different, and adjacent ones may be combined with each other.

Hu et al. discloses the following compound:

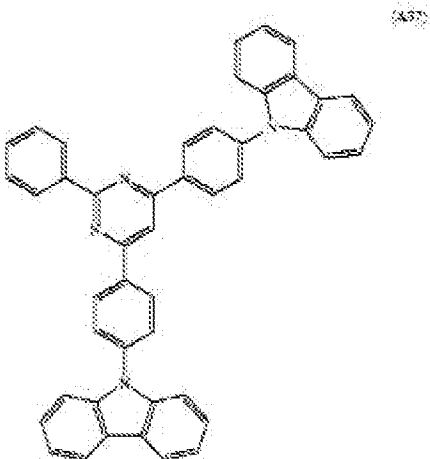


(col. 6) with R<sub>11</sub>, R<sub>12</sub>, R<sub>13</sub>, and R<sub>14</sub> = H such that Ar = benzentriyl, R<sub>A</sub> = phenyl, R<sub>B</sub> = phenyl, R<sub>C</sub> = anthracene group as a hydrocarbon compound for host material for an organic EL device (col. 4, lines 16-18). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the host material as disclosed by Hu et al. for the host material as disclosed by Higashi et al. in view of Begley et al. The motivation is provided by the fact that the compound as disclosed by Higashi et al. is a known host material for an organic EL device that is similarly an aromatic hydrocarbon comprising an anthracene group, rendering the substitution predictable with a reasonable expectation of success.

4. Claims 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higashi et al. (US 6,617,051 B1) and further in view of Begley et al. (US 2005/0095453 A1) and Iwakuma et al. (US 2004/0086745 A1).

Higashi et al. in view of Begley et al. discloses the organic EL device according to Claim 25 as shown above. Higashi et al. discloses a wide variety of host materials for the light-emitting layer (col. 9-23). However, they do not explicitly disclose an aromatic heterocyclic compound according to Formula (1) as defined by the Applicant.

Iwakuma et al. discloses the following as possible host material in the light-emitting layer of an organic EL device ([0056]) that can be paired with a phosphorescent dopant ([0058]):



(page 24) such that Ar = pyrimidinetriyl group and  $R_A$ - $R_C$  = substituted/unsubstituted aromatic group having 6 carbon atoms (i.e., phenyl group) according to Formula (1) as defined by the Applicant. It would have been obvious to substitute such a host material for the host materials of the organic EL device as disclosed by Higashi et al. in view of

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Begley et al. The motivation is provided by the fact that the organic EL device as disclosed by Higashi et al. in view of Begley et al. comprises a dopant that is phosphorescent with nitrogen-containing aromatic compounds as host material in the light-emitting layer, in addition to the fact that Iwakuma et al. specifically discloses compounds shown above as effective host material that can be paired with such dopants, thus rendering the substitution predictable with a reasonable expectation of success.

### ***Response to Arguments***

1. The Applicant argues that one of ordinary skill in the art would not find it obvious to produce a phosphorescent organic EL device possessing low halogen impurity concentrations from that of the primary reference Higashi et al. and that undue experimentation would be required. The Examiner disagrees.

Regarding the consideration of modifying the fluorescent organic EL device to that of a phosphorescent one without destroying the invention of Higashi et al., it is clear that the construction of fluorescent organic EL devices are widely known as exemplified by Begley et al. which discloses the interchangeability between phosphorescent and fluorescent dopants ([0115]) and proceeds to disclose a general class of compatible host materials including nitrogen-containing anthracene derivatives ([0136]) that can be used in combination. Furthermore, the host materials that are disclosed by Begley et al. are also anthracene-based compounds that can be nitrogen-containing such that it would have been reasonable to assume upon phosphorescent dopant substitution, the

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host materials as disclosed by Higashi et al. (that are also nitrogen-containing anthracene-based) would be compatible since it would have more similar energies to the host materials as disclosed by Begley et al. and thus necessarily higher triplet energy gaps compared to the phosphorescent dopant.

Regarding the issue of impurity concentrations and the Applicant's claim that Higashi et al. has a "limited and non-enabling disclosure," it is position of the Examiner that Higashi et al. clearly had possession of such limitations (and also such that in combination with the secondary references given above, the invention and the unexpected results as claimed/demonstrated by the Applicant could have been produced by one of ordinary skill in the art). As shown above, Higashi et al. gives clear motivation for the desirability of reducing halogen impurity concentrations in order to improve device performance (col. 1, lines 52-66) and discloses the desirability of achieving 0 ppm halogen impurity concentration (col. 2, line 13). Furthermore, the method of purification (sublimation; col. 39, lines 40-50) is identical to the method of purification as disclosed by the Applicant ([0052]).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. YANG whose telephone number is (571)270-1137. The examiner can normally be reached on Monday to Thursday from 8:30 am to 6:00 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer A. Chriss can be reached on (571)272-7783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Supervisory Patent Examiner, Art  
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Examiner, Art Unit 1786